

FLG 0109
Análise Espacial e
Geoprocessamento

SENSORIAMENTO REMOTO E
PROCESSAMENTO DIGITAL DE IMAGENS

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O que é Sensoriamento Remoto?

Arte e ciência da obtenção de informação sobre um objeto *sem contato físico direto* com o objeto. É a tecnologia científica que pode ser usada para medir e monitorar importantes características biofísicas e atividades humanas (JENSEN, 2000).

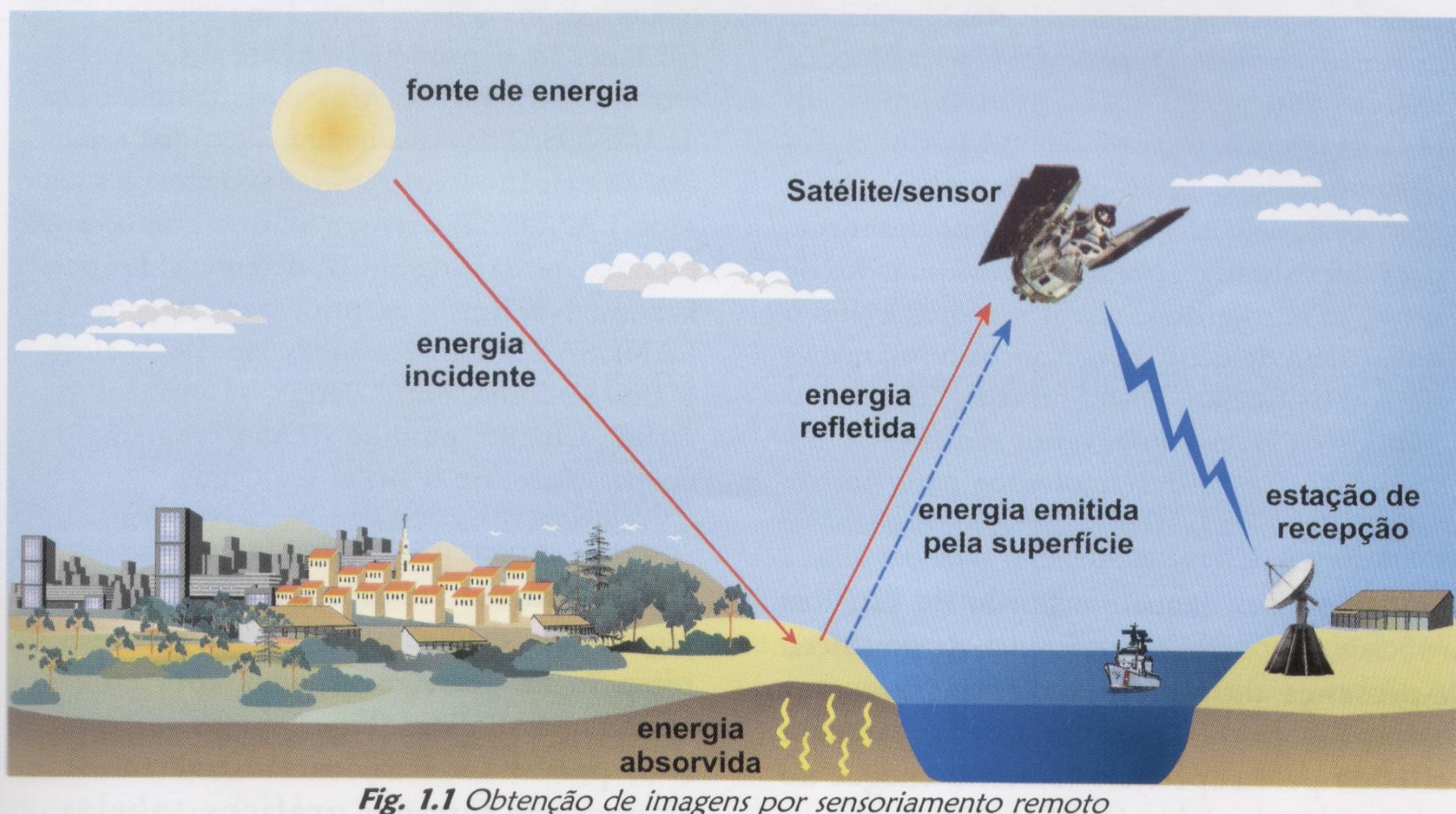
Principais Divisões

Sensoriamento Remoto Orbital (Satélites)

Sensoriamento Remoto Aéreo (Aviões)

Levantamentos em campo

Aquisição de dados



Aquisição de dados

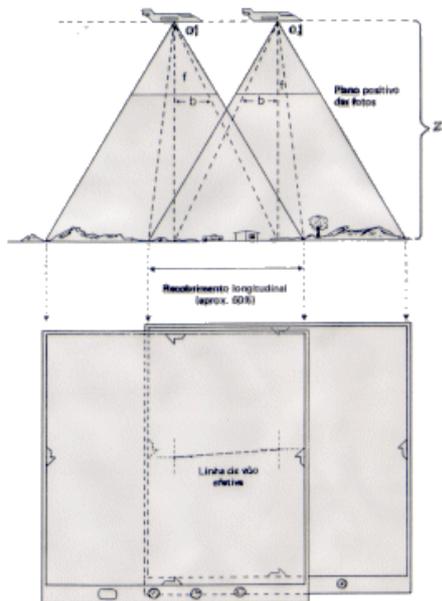
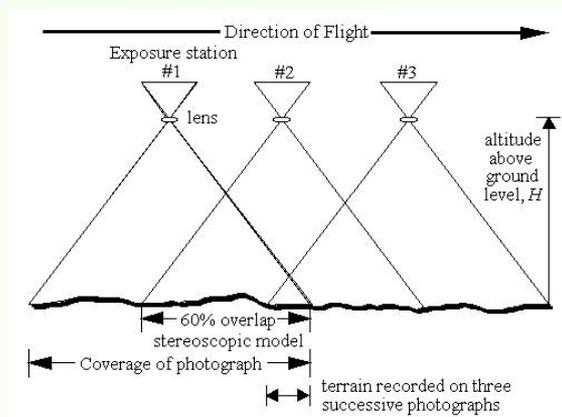
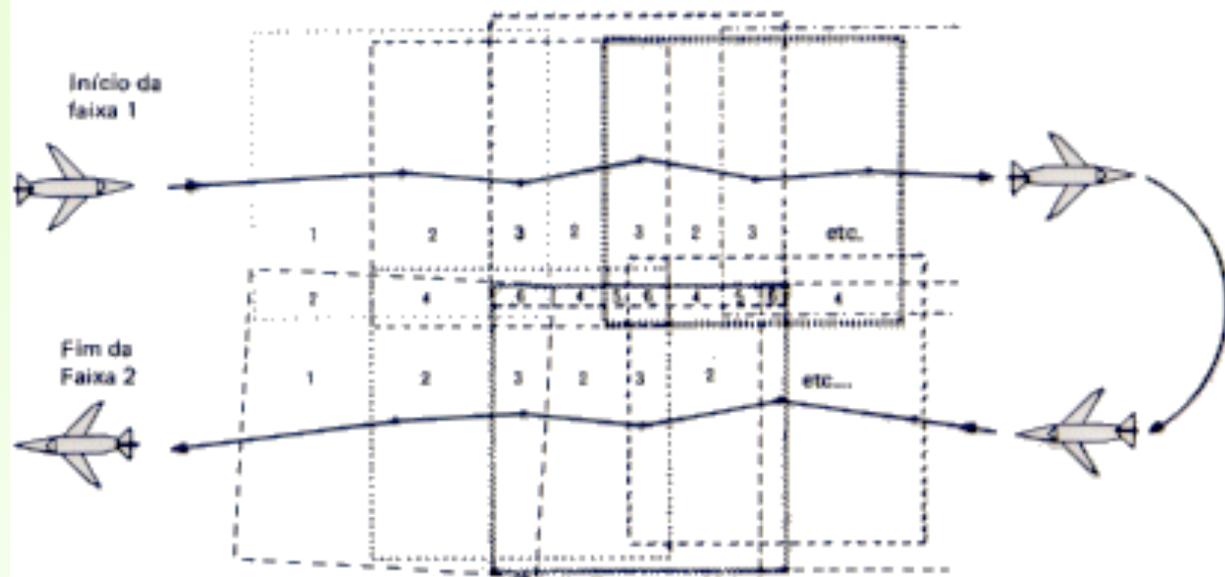
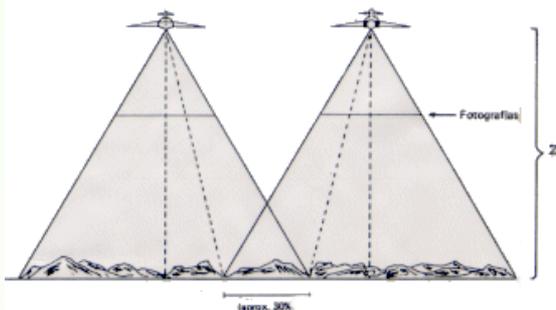
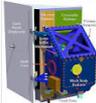


fig. 4.3 - Recobrimento longitudinal

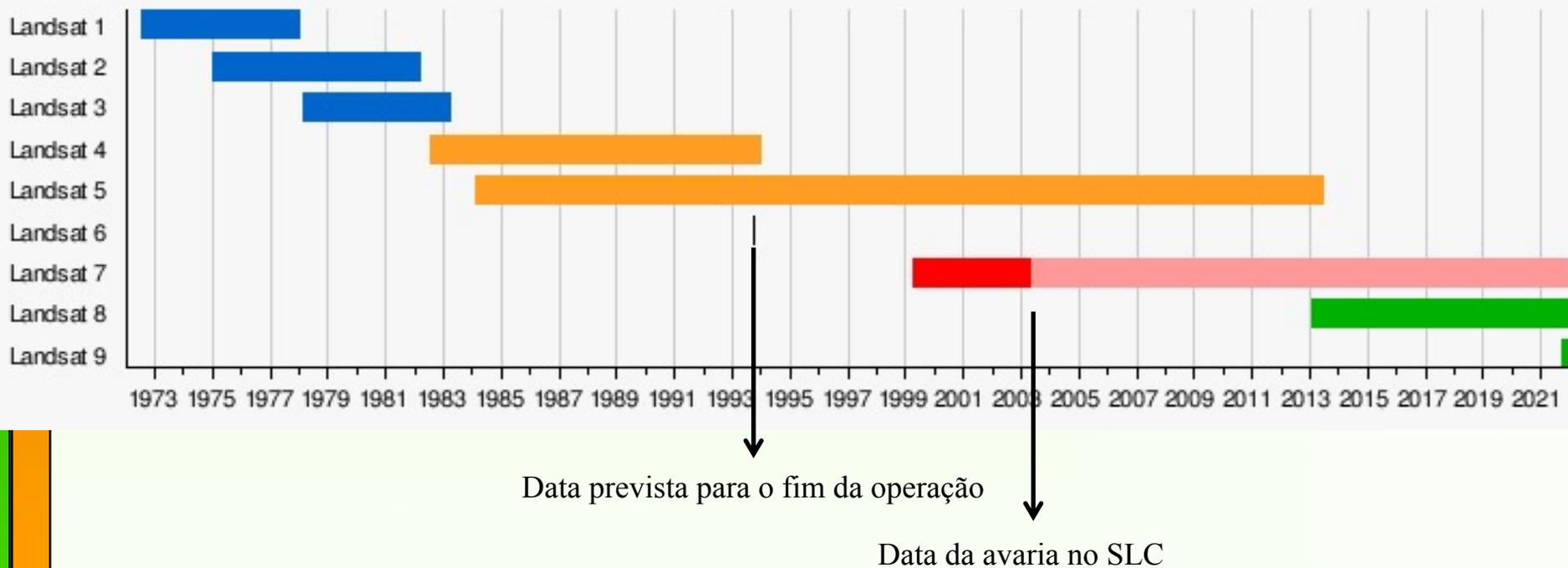


Programa Landsat

Instrument	Picture	Launched	Terminated	Duration	Notes
Landsat 1		July 23, 1972	January 6, 1978	2 years, 11 months and 15 days	Originally named Earth Resources Technology Satellite 1.
Landsat 2		January 22, 1975	February 25, 1982	2 years, 10 months and 17 days	Nearly identical copy of Landsat 1
Landsat 3		March 5, 1978	March 31, 1983	5 years and 26 days	Nearly identical copy of Landsat 1 and Landsat 2
Landsat 4		July 16, 1982	December 14, 1993	11 years, 4 months and 28 days	First of the TM sensors with 30 m spatial resolution.
Landsat 5		March 1, 1984	June 5, 2013 ^[7]	29 years, 3 months and 4 days	Nearly identical copy of Landsat 4. Longest Earth-observing satellite mission in history.
Landsat 6		October 5, 1993	October 5, 1993	0 days	Failed to reach orbit.
Landsat 7		April 15, 1999	Still active	16 years, 11 months and 27 days	Operating with scan line corrector disabled since May 2003. ^[8]
Landsat 8		February 11, 2013	Still active	3 years and 2 months	Originally named Landsat Data Continuity Mission from launch until May 30, 2013.
Landsat 9		September 27, 2021		Landsat 9 is a rebuild of its predecessor Landsat 8	

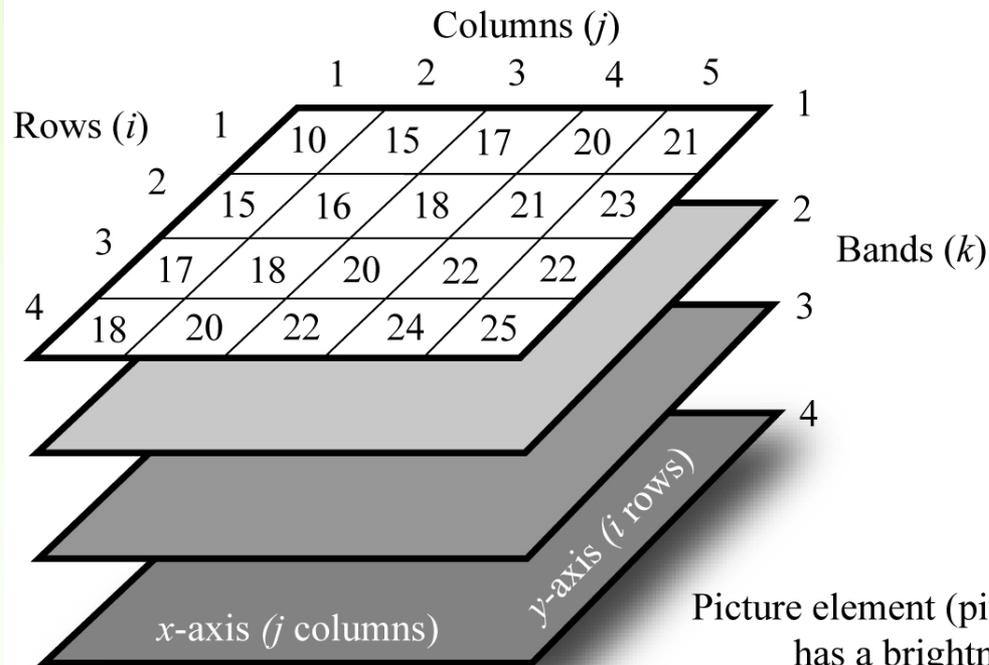
Programa Landsat

Chronological Launch and Retirement History



Estrutura de uma imagem digital

Digital Image Terminology



Brightness value range (often 8-bit)

255 — white

127 — gray

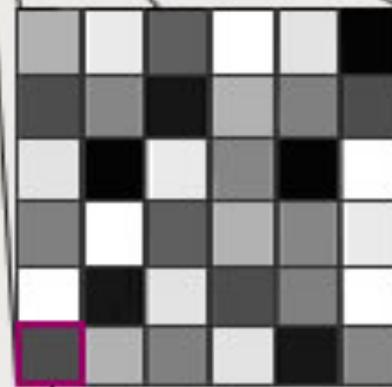
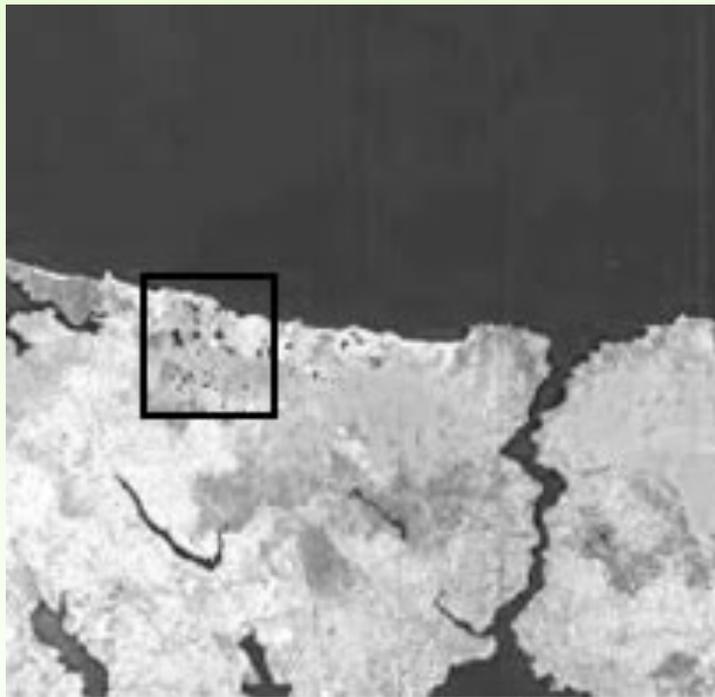
0 — black

Associated grayscale



Picture element (pixel) at location row 4, column 4, band 1 has a brightness value of 24, i.e., $BV_{4,4,1} = 24$

Estrutura de uma imagem digital



Pixel

165	242	85	254	220	0
70	140	21	168	123	74
232	0	243	142	0	255
122	255	85	171	134	236
236	15	220	71	110	255
85	174	114	223	14	140

Digital Number
(DN)

Processamento digital de imagens: Funções

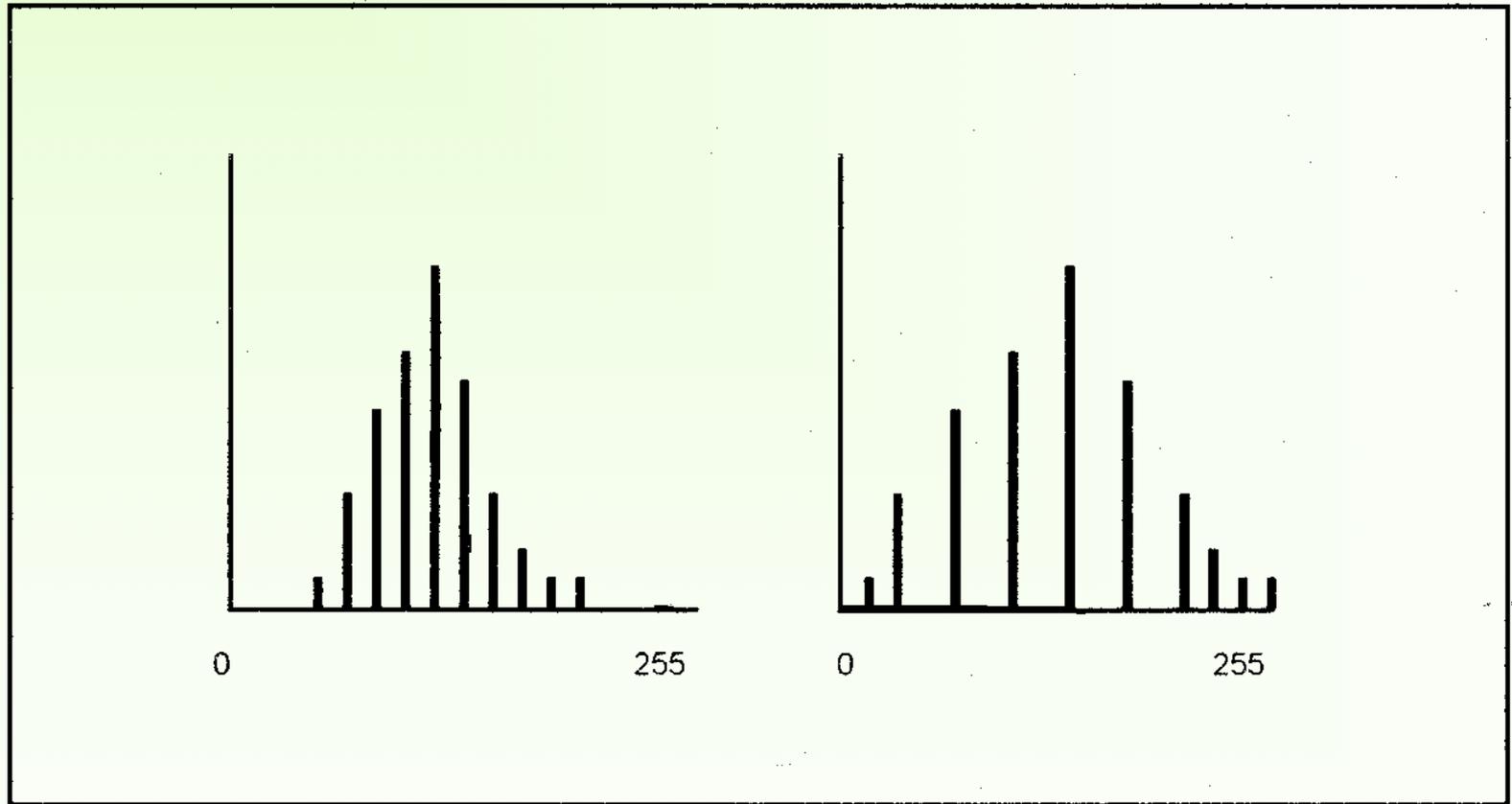
- Facilitar a identificação e extração da informação contida nas imagens para posterior interpretação;
- Remover ou amenizar degradações e distorções que limitam a capacidade visual humana;
- Processar grande quantidade de dados

Processamento digital de imagens

O processamento digital de imagens de sensoriamento Remoto é dividido em:

- Realce: aplicar contrastes nas imagens;
- Pré-processamento: correção radiométrica e geométrica das imagens;
- Classificação: realizar o mapeamento utilizando algoritmos de agrupamento de padrões.

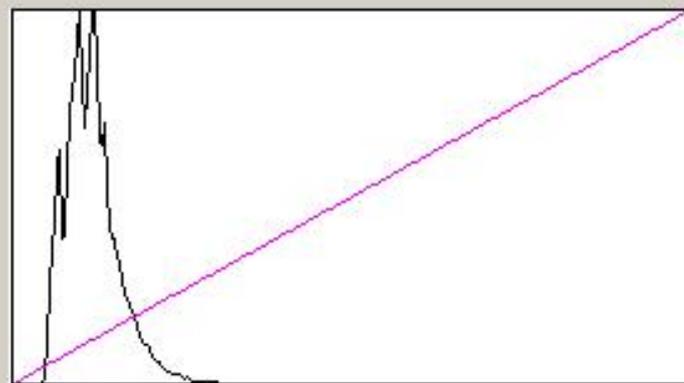
Aumento linear de contraste





Contraste

Operação Canal Exibir Executar Ajuda



Nível de Entrada: 125

LUT/População

Entrada: 125 0 Nova: 125 0

Média Edição(saída)

M: 30.60 G: B:

Valores Fatias

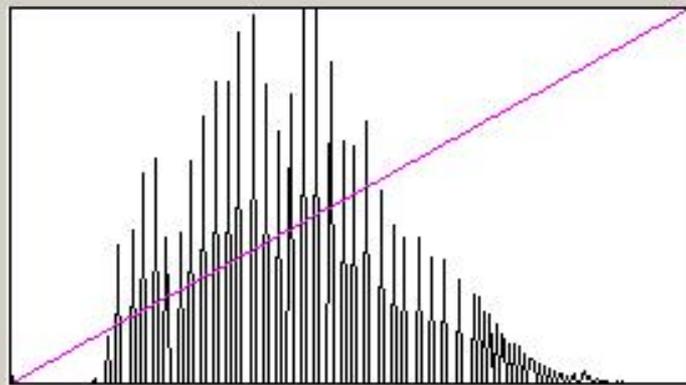
Mín: 0 CR Máx: 255 CR 5 CR

Salvar Imagem

Nome: Banda



Contraste



Nível de Entrada:

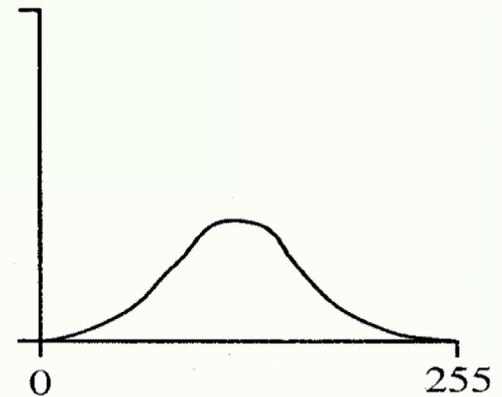
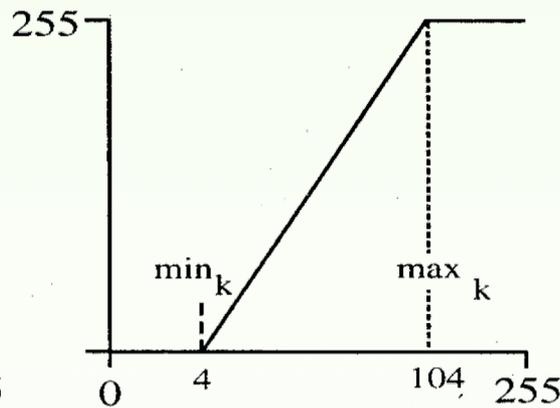
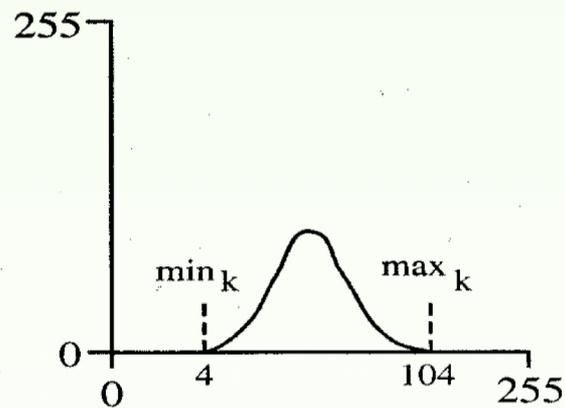
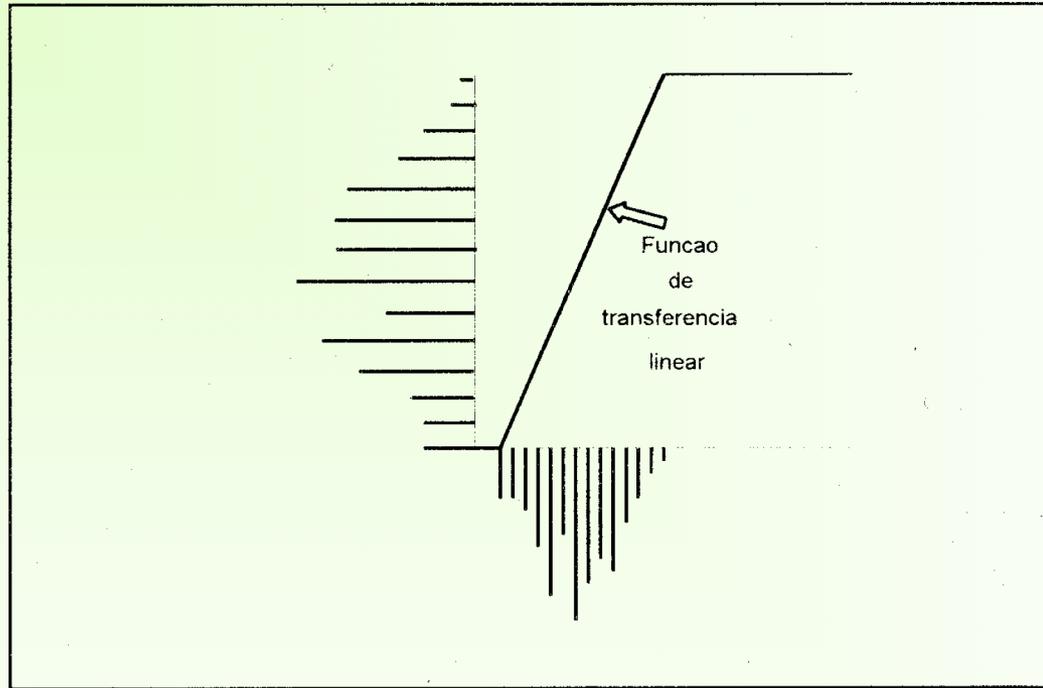
LUT/População
Entrada: Nova:

Média
M: G: B:
Edição(saída)

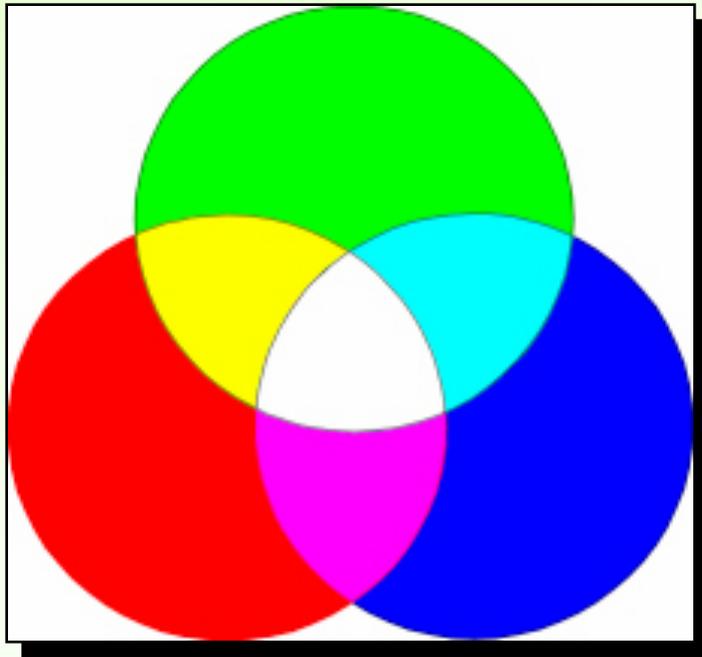
Valores
Mín: Máx:
Fatias

Salvar Imagem
Nome: Banda

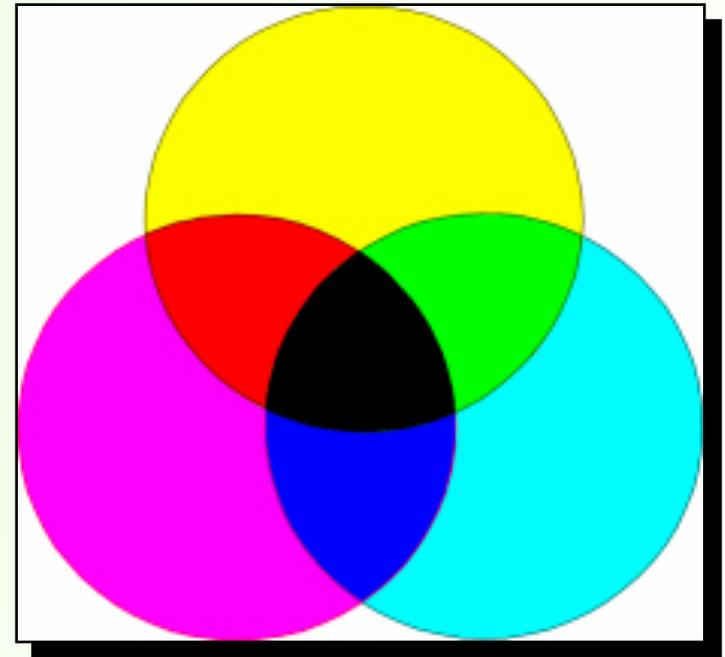
Função de transferência Linear



Composições coloridas RGB

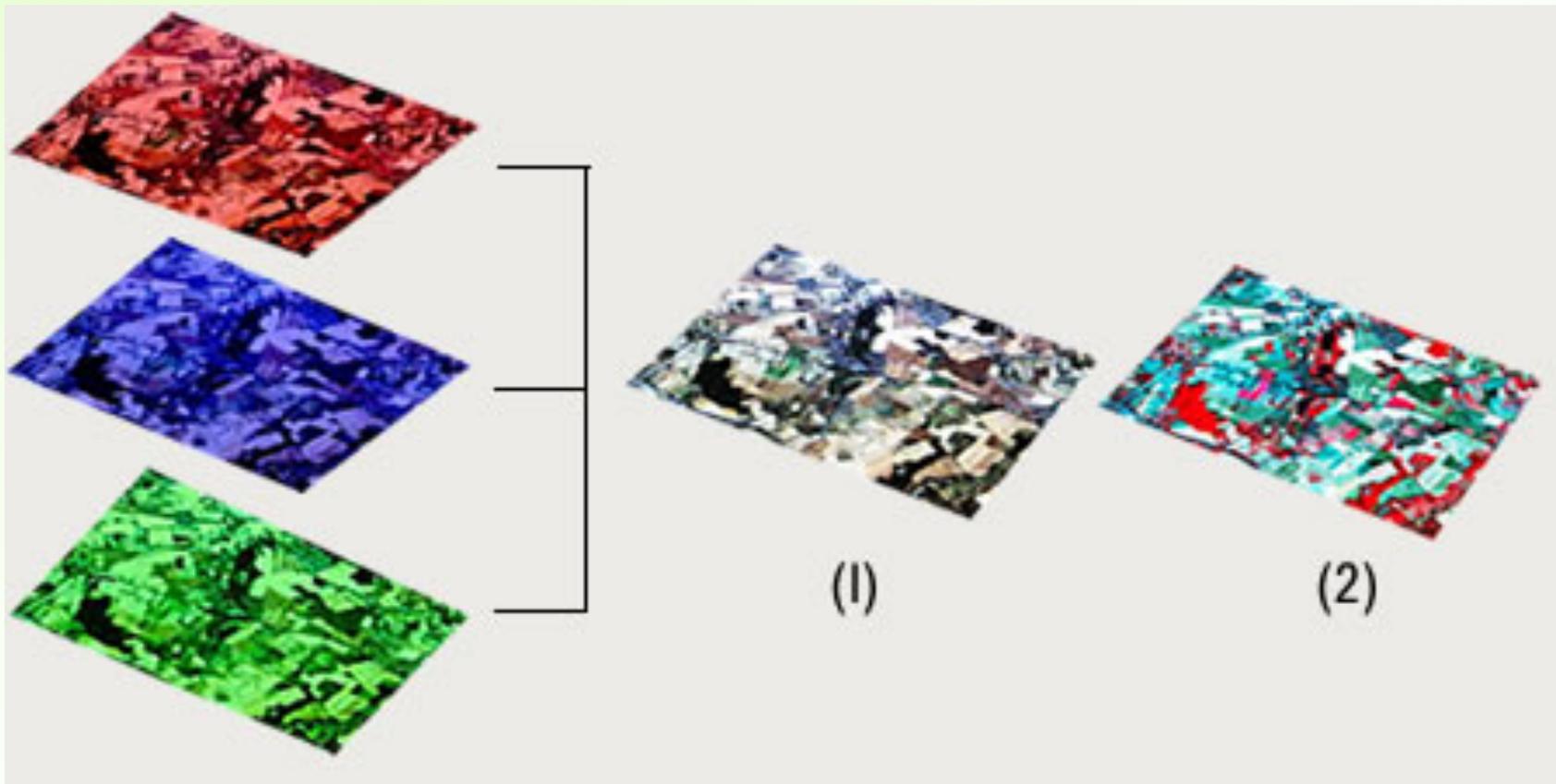


Aditivas



Subtrativas

Composições coloridas RGB



Composições coloridas RGB

Imagem Landsat 7 ETM+ da região de Santos - SP
Composição colorida 5 (R), 4 (G), 3 (B) - órbita 219/77 data 07/08/01



Banda 3



Banda 4



Banda 5

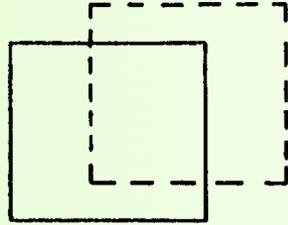
Composições coloridas RGB

imagem CBERS 2 CCD da região de Manaus - AM
composição colorida 4 (R), 3 (G), 2 (B) - órbita 173/103 data 17/08/04

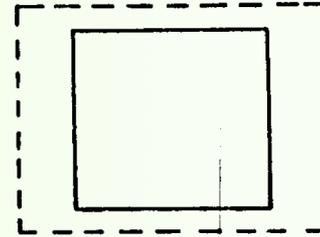


Distorções

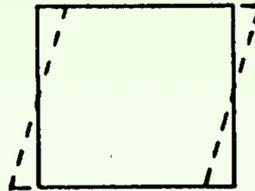
Translação



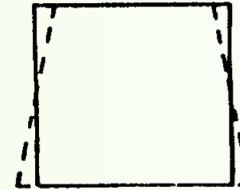
Altitude



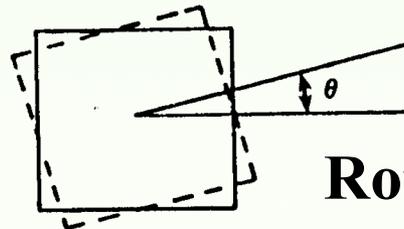
Inclinação



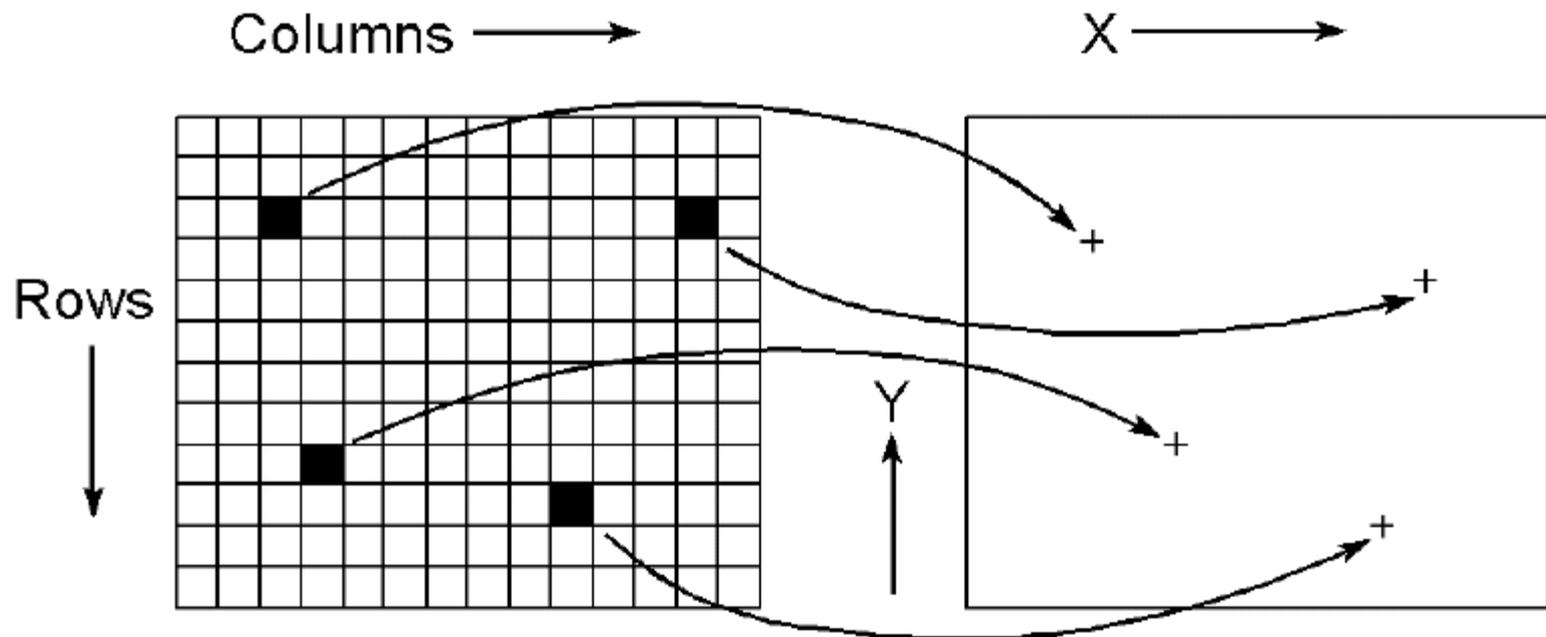
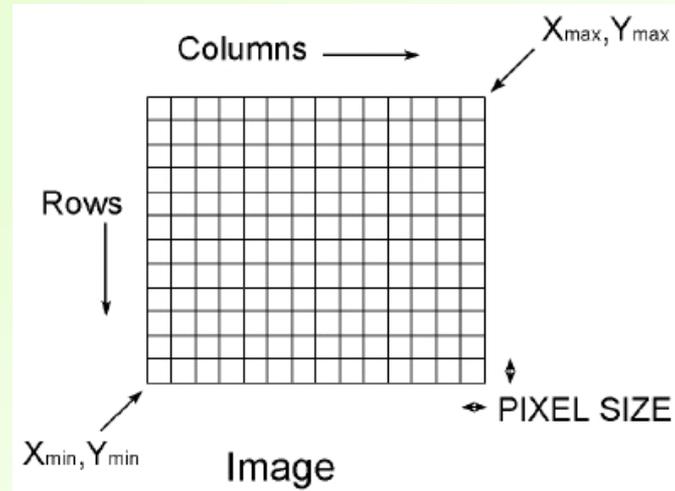
Perspectiva



Rotação



Georeferenciamento

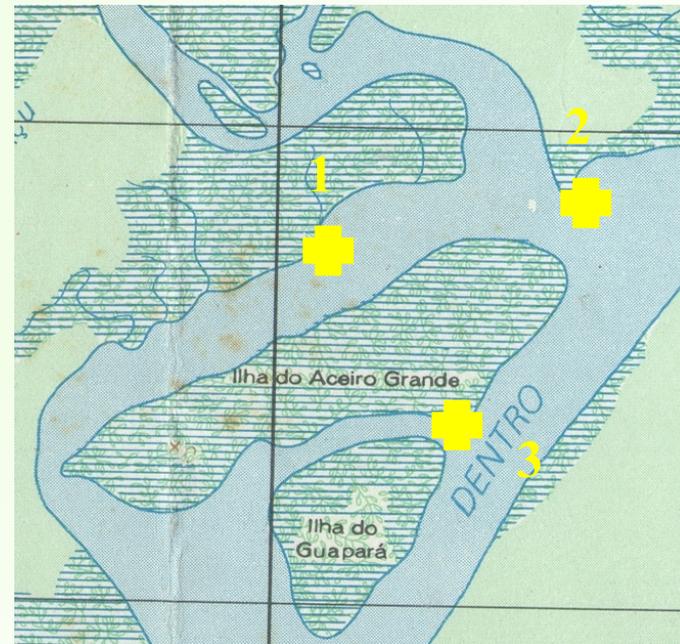


Georeferenciamento

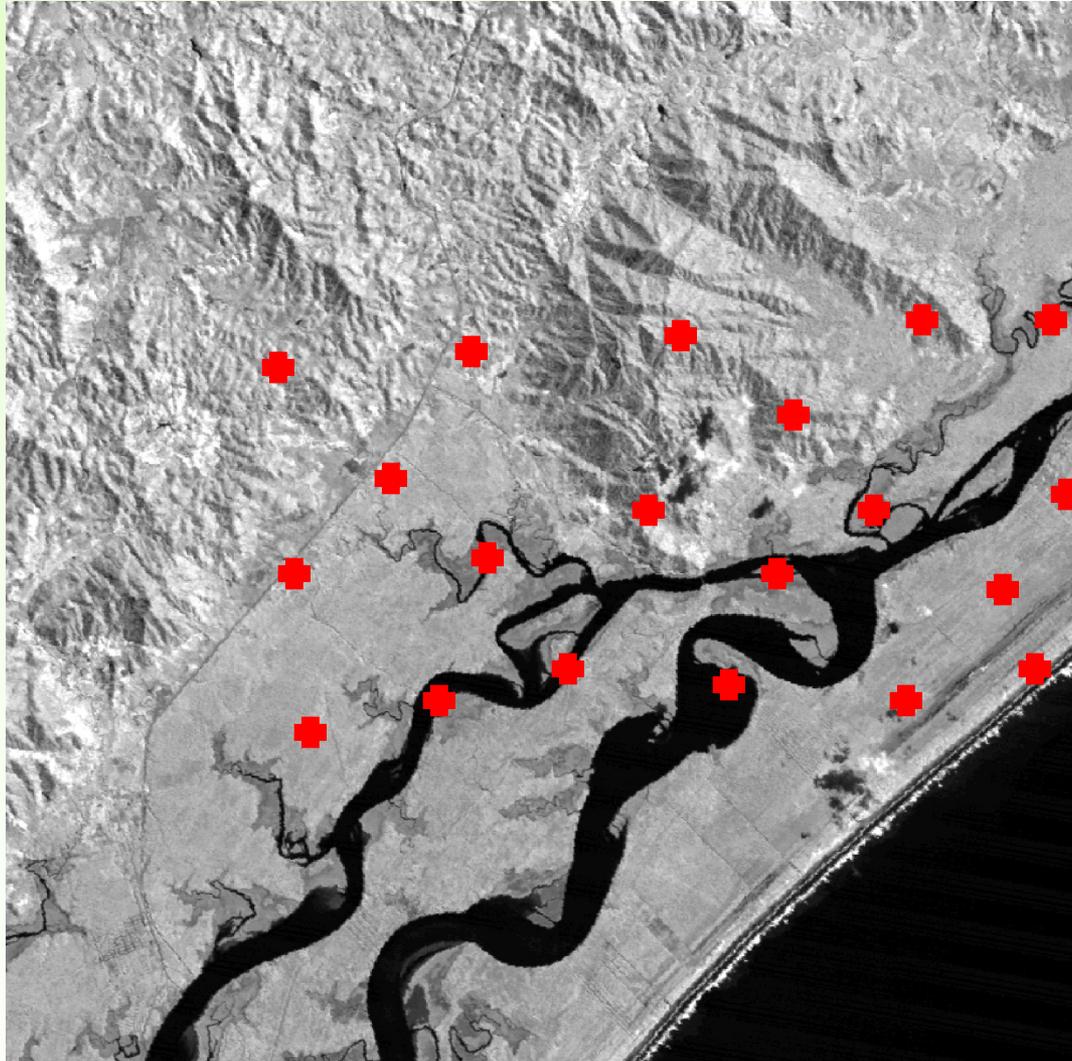


Georeferenciamento

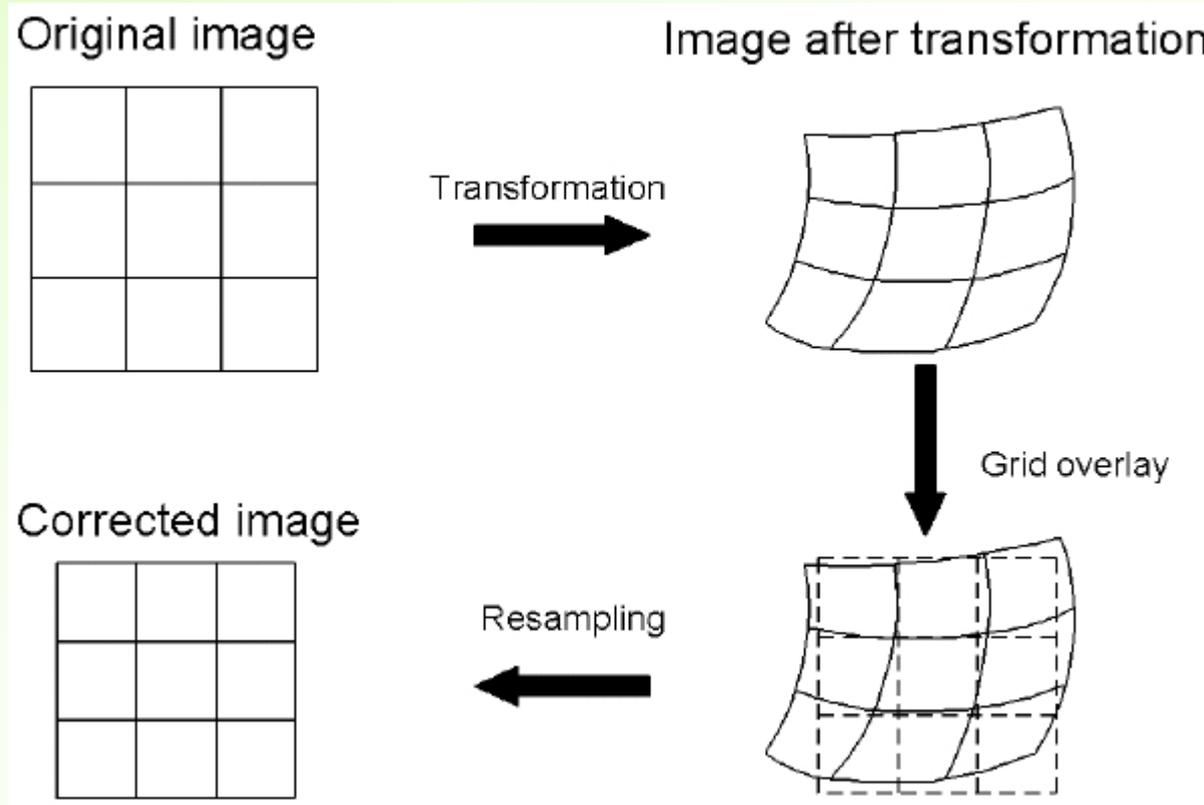
Seleção de pontos comuns



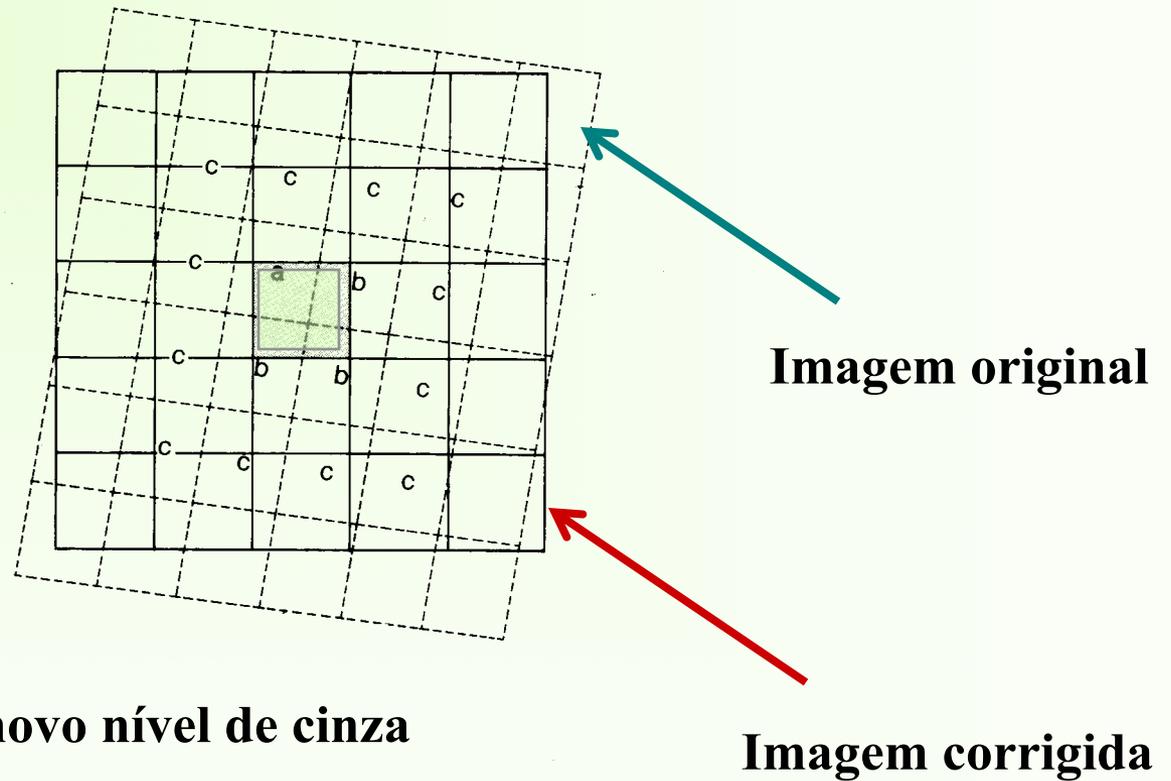
Georeferenciamento



Reamostragem



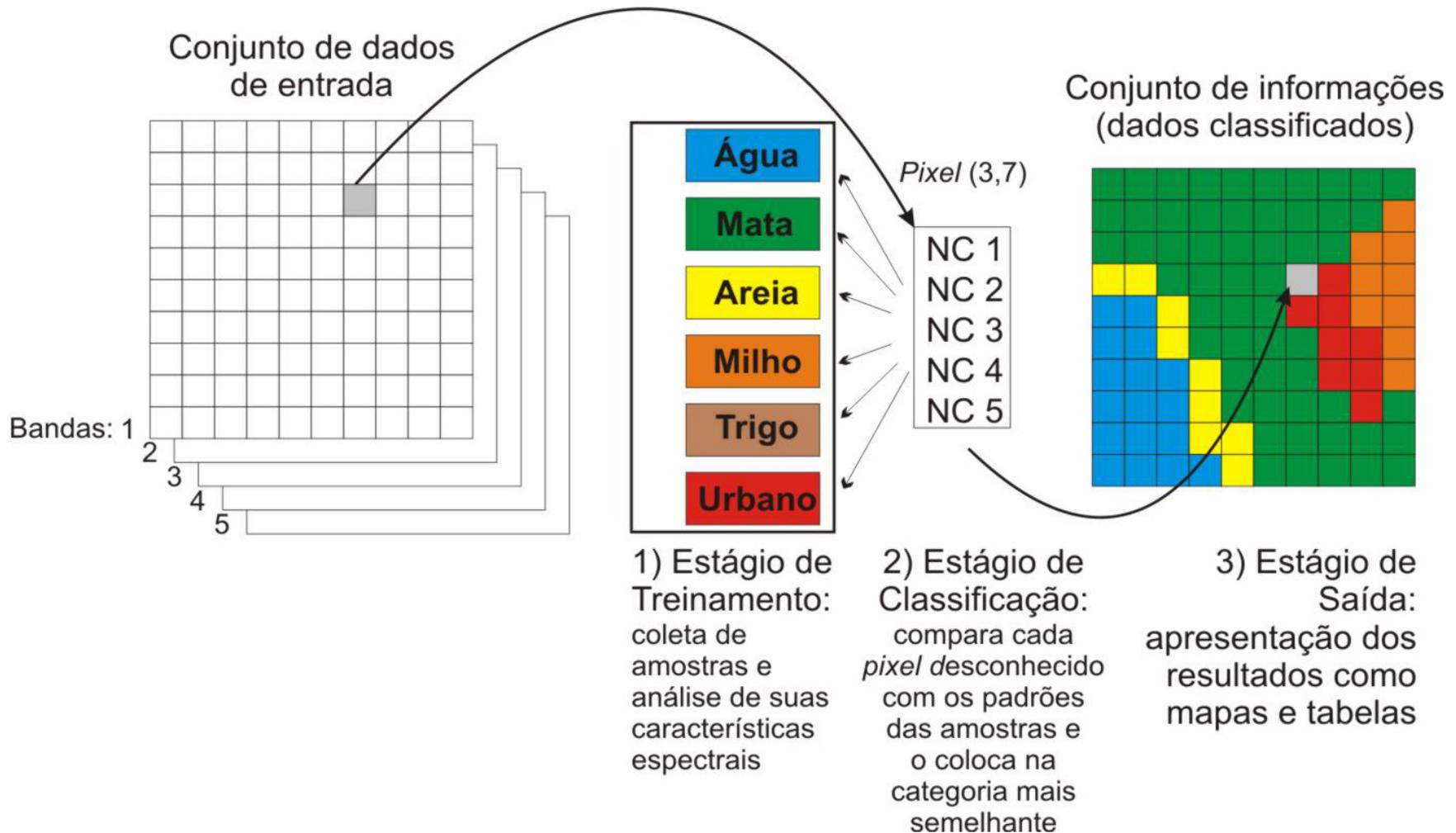
Reamostragem



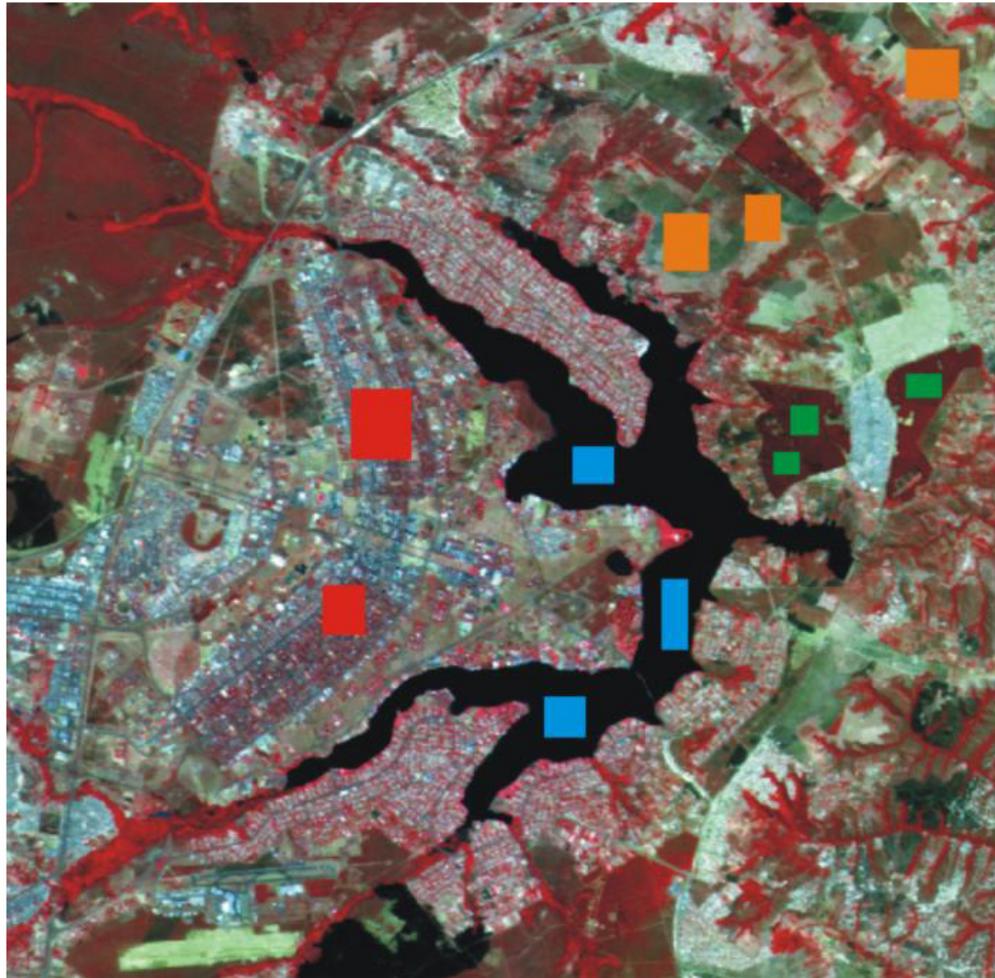
Valor do novo nível de cinza

Imagem corrigida

Classificação de padrões



Seleção de amostras

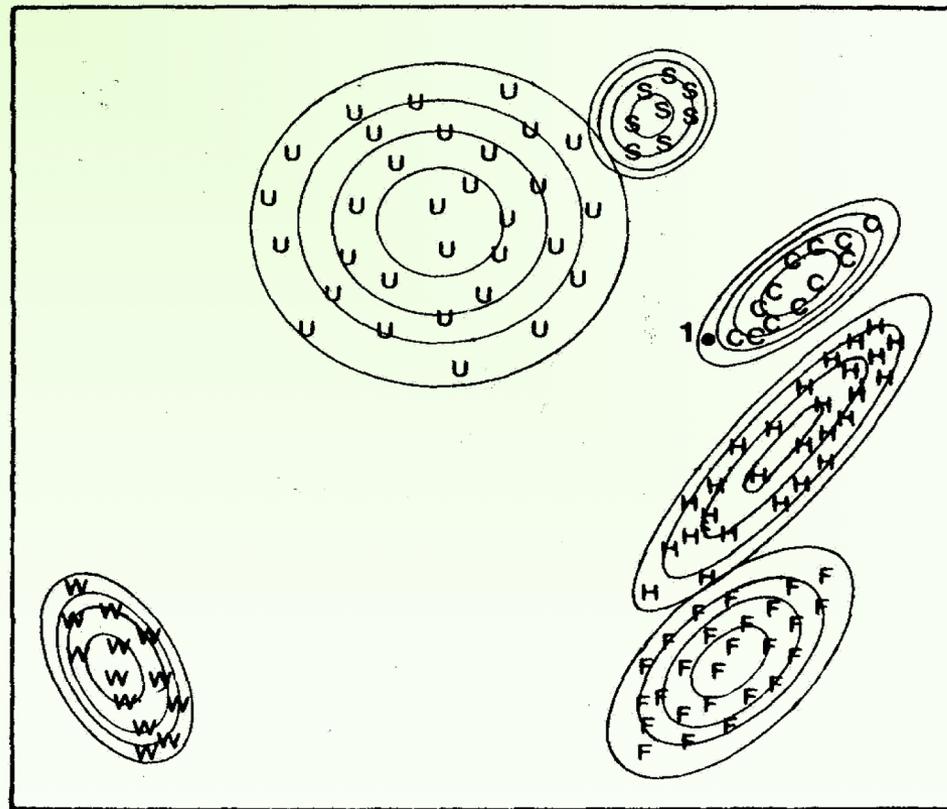


LEGENDA

-  Urbano
-  Água
-  Reflorestamento
-  Agrícola

Máxima Verossimilhança

Banda 2



Banda 1

Fichamento para entrega até o dia 16/11/2023

Os novos enfoques da Geografia com o apoio das Tecnologias da Informação Geográfica.

Reinaldo Paul Pérez Machado

<https://www.researchgate.net/publication/266387529>

O link para **baixar** o arquivo estará disponível no Moodle.
Fazer a entrega no próprio Moodle conforme instruções.

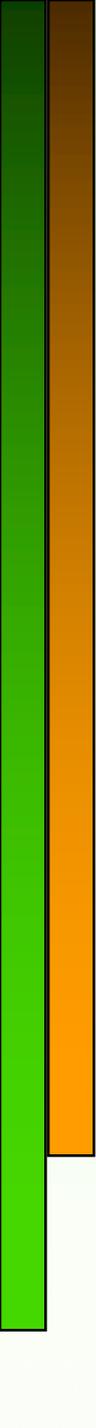
Exercício prático: Uso da Terra.

O objetivo é gerar um mapa imagem utilizando os recursos de processamento digital de imagens com as técnicas de classificação automática. Os alunos deverão executar 4 etapas segundo detalhado no tutorial:

- ✓ **Realce de Contraste**
- ✓ **Composições Coloridas**
- ✓ **Correção Geométrica**
- ✓ **Classificação**

PARA BAIIXAR ILWIS

<http://ilwis-academic.software.informer.com/download/>



Muito obrigado pela atenção!